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cooperating.

ANNUAL REPORT -- FY 1986

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Cover--Nesting populations of Canada Geese on Ninepipe Reservoir increased about eight-fold between the 1950's and the 1980's; the increase apparently resulted from island construction and improved management of spring water levels. Elsewhere in the Flathead Valley, populations remained about stable where habitat conditions remained unchanged and declined where habitat had deteriorated. Throughout the study area, the population increased from about 200 nesting pairs in the 1950's to 300 pairs in the 1980's.

Photo by John J. Craighead



Capercaillie (*Tetrao urogallus*) have decreased during recent years as large areas of mature timber in Norway and Sweden were clear-cut. The exact mechanism of the decline was not known until completion of a recent study. The capercaillie hens nested in clearcuts and mature timber, and predation on nests was excessive in both situations. Clear-cutting has caused a dramatic increase in moose (*Alces alces*), and the harvest is very high with a great deal of viscera left in the woods during winter. This food supply has increased the survival of avian and mammalian predators to a point where nest predation is endangering the forest grouse.

Photo by Per Wegge

ANNUAL REPORT

of the

MONTANA COOPERATIVE WILDLIFE RESEARCH UNIT

University of Montana

Missoula, Montana

to

UNIVERSITY OF MONTANA

MONTANA DEPARTMENT OF FISH, WILDLIFE AND PARKS

WILDLIFE MANAGEMENT INSTITUTE

U.S. FISH AND WILDLIFE SERVICE, DEPARTMENT OF THE INTERIOR

Volume 3

October 1985-September 1986

Respectfully submitted,

  
Bart W. O'Gara, Leader

  
Joe Ball, Ass't. Leader

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A male wolf captured in October 1985 spent summers in the British Columbia portions of the Flathead drainage but returned to the U.S. portion during the winter. A wolf pack also containing radio-marked individuals produced seven pups in 1985 and five in 1986.

Photo by Diane Boyd

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MONTANA COOPERATIVE WILDLIFE  
RESEARCH UNIT PERSONNEL

Coordinating Committee

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Bart W. O'Gara, U.S. Fish and Wildlife Service,  
Missoula

Unit Staff

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Joe Ball, Assistant Leader  
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Donald A. Jenni, Zoology Department  
Charles Jonkel, Forestry School  
Les Marcum, Forestry School  
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Dan Pletscher, Forestry School  
Robert R. Ream, Forestry School  
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Virginia Johnston, Secretary

Graduate Students

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Harry Carriles	Sandy Kratville
Brent Costain	Rob Leary
Ana Dronkert	Tim Lingel-Pate
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Sherry Eisner	Jo Meeker
Steve Gniadek	Steve Nadeau
John Grant	Dennis Orthmeyer
Christine Hass	Sally Sovey
Jim Hayden	Tim Thier
Amy Johnston	Per Wegge
Timm Kaminski	Rick Yates



COOPERATING AGENCIES

University of Montana  
Montana Department of Fish, Wildlife and Parks  
Wildlife Management Institute  
U.S. Fish and Wildlife Service

Bonneville Power Administration  
Boone and Crockett Club  
Bureau of Indian Affairs  
Bureau of Land Management  
Camp Fire Conservation Club  
Chempar Products Division of Lipha Chemicals  
Confederated Salish and Kootenai Tribes  
Directorate of Wildlife and Freshwater Fish, Norway  
Double Four Corporation  
Grizzly Bear Recovery Coordination Office  
Idaho Department of Fish and Game  
International Snow Leopard Trust  
Kirthar National Park, Pakistan  
Missoula County Rodent Control Board  
Montana Department of Agriculture  
Montana Power Company  
Murphy, D. Michael  
National Parks and Conservation Association  
National Rifle Association  
National Wildlife Federation  
North American Foundation for Wild Sheep  
Northwest College and University Association for Science  
Pakistan Forest Institute  
Sind Wildlife Management Board, Pakistan  
The Trumpeter Swan Society  
UNESCO  
U.S. Department of Energy (INEL Site)  
U.S. Fish and Wildlife Service  
    Benton Lake NWR  
    Division of Refuges  
    Migratory Bird Management Office  
    National Bison Range  
    Northern Prairie Wildlife Research Center  
    Sheldon-Hart NWR  
    Office of International Affairs  
U.S. Forest Service  
    Beaverhead, Bitterroot, Boise, Challis, Clearwater,  
        Flathead, Kootenai, Nezperce, Payette, Salmon, and  
    Targhee national forests  
    Intermountain Research Station, Forest Sciences Laboratory  
    Montana Forest and Conservation Experiment Station  
    Rocky Mountain Forest and Range Experiment Station  
U.S. National Park Service  
    Glacier and Yellowstone parks  
Wildlife Institute of India  
Wyoming Game and Fish Department



PERSONNEL   NOTES

The following personnel joined the Unit on nongraduate student appointments of varying length:

Canada Duck Banding

Nathan Hall  
Jackie Henne

Susan Kraft  
John Lord

CSKT-BPA Goose Studies

Ken Clairmont  
Shari Gregory  
Dennis Mackey

Bill Matthews  
Kathy O'Connor  
Bill Swaney

BIA-Kerr Dam Wildlife Studies

Dale Becker  
Curtis Mack

Pat Mullen  
Kerry Murphy

Other Field Studies

Kevin Berner  
Russ Beuch (V-S)  
Andrea Blakesley (V-S)  
Diane Boyd  
Pamela Broussard (V-S)  
Joseph Butler (V-S)  
James Cofske  
Steve Cuthbert (V-S)  
John Dahlke  
Diana Doan  
Dan Edge  
Mike Fairchild  
William Falvey (V-S)  
Gary Fralich (V-S)  
Joe Fox  
Ruth Gale  
Mark Haroldson  
Rich Harris  
Ann Henry (V-S)

Kit Hershey (V-S)  
Jeff Holm  
David Horning  
Lynn Klassen  
Lisa Jerez (V-S)  
James J. Jonkel (V-S)  
Amy Johnston (V-S)  
John Malloy  
Randy Matchett  
Douglas McAlister (V-S)  
Steve Nadeau  
Bill Noble  
Sally Olson-Edge  
Andrea Peterson (V-S)  
Brad Rogers (V-S)  
Pat Tucker  
Duggins Wroe  
Mike Young

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(V-S) = Volunteer with subsistence allowance.  
All others are paid positions.

Work Study and YCC Students

Carmen Andonaegui  
William Falvey  
Jenaya Forman  
Brian Hensel  
Mark Hurley  
Kellianne Johnson  
Richard Johnston

John Murnane  
Lori Phillips  
Tom Radandt  
Denise Roth  
Scott Snelson  
Jonathan Stoltz  
Dan Taylor



White-tailed deer in a second-growth forest of Western Montana used dense canopy forests more and nonforested areas less than availability, except during spring nights. The only tree diameter class that seemed to attract radioed deer was residual old growth.

Photo by Bart O'Gara

## ABSTRACT

Berner, Kevin L., M.S., Fall 1985

Wildlife Biology

Winter and Spring Habitat Selection by White-tailed Deer in a Western Montana Second-growth Forest (98 pp.)

Director: Bart W. O'Gara

Winter and spring habitat selection were studied during 1982-83 and 1983-84 at Lubrecht Experimental Forest. Both winters were unusually snow free. Deer concentration areas were located the first winter and an attempt was made to trap adult female deer; however, only 2 males were captured. Habitat types were mapped; vegetation data collected; and 23 transect lines established on winter concentration areas between June and September 1983. Two potential new community types were described. Four adult female and 4 adult male white-tailed deer were trapped that summer. Pellet transects were read during October 1983 and April 1984. Eleven deer (1 adult female, 5 adult males, and 5 fawns) and 7 elk were trapped between 11 December 1983 and 3 January 1984. Four radioed deer were located 127 times during winter, 1 December-28 February, and 107 times during early spring, 1 March-30 April. Home range sizes during winter ranged from 348.6 to 1274.9 acres (141 to 505 ha); spring ranges being from 348.4 to 889.6 acres (141 to 360 ha). Deer appeared to prefer the dense canopy classes and used nonforested areas less than they were available, except during spring nights. Moist habitat types, PSME/VACA, PSME/LIBO, and PSME/VAGL were used more than their availability in all analyses. Radioed deer selected PSME/SYAL/CARU during the winter, PIPO series stands during both seasons, and avoided PSME/PHMA habitat types. Radioed deer showed more use of uncut areas than predicted. The only tree diameter class that seemed to attract deer was residual old growth. Deer use was high on areas with dense shrub cover under 1.6 feet (0.5 m) tall. Higher pellet concentrations were found on northerly slopes than southerly slopes. Radio-collared deer selected slopes between 6 and 25%, while pellet data indicated deer use was concentrated on slopes between 26 and 35%. Deer did not appear to select for any crown diameter class, stands containing seedlings or saplings, or presence of shrubs taller than 1.6 feet (0.5 m). Pellet deposition may have been highest in bedding and travel areas; whereas radio locations may give a better estimate of use in feeding areas.

# ABSTRACT

Grant, John, M.S., Fall 1986

Wildlife Biology

Ecology of Black-tailed Jack Rabbits Near a Radioactive Waste Disposal Site in Southeastern Idaho

Director: I. J. Ball

A study of black-tailed jack rabbits was conducted from July 1982 until October 1985 at the Radioactive Waste Management Complex (RWMC) of the Idaho National Engineering Laboratory in southeast Idaho to evaluate the potential role of this species in radionuclide transport. Population estimates during annual summer highs were 2.76/ha in 1982, 0.91/ha in 1983, and 0.40/ha in 1984 compared to near zero each winter. Radio-telemetry provided summer home range estimates of 31.0 ( $\pm$  12.4) ha. All radio-collared jack rabbits departed RWMC in late fall and traveled as far as 57.3 km ( $\bar{x}$  = 16.2  $\pm$  13.2). Disturbed habitat at RWMC was utilized more during nights; natural habitat more during days. Crested wheatgrass and summer cypress, which were associated with disturbed sites, were the 2 most abundant plants in diets. The potential for radionuclide transport from the RWMC is discussed, even though body tissues did not have significantly elevated radionuclide concentrations.

# ABSTRACT

Nadeau, M. Steven, M.S., Fall 1986

Wildlife Biology

Habitats and Trail Situations Associated with Human/Grizzly Bear Confrontations in Glacier National Park, Montana

Directors: Bart W. O'Gara, Chris Servheen

Habitats, trails, and human and grizzly behavior were analyzed in 3 phases to identify problem situations in Glacier Park. Phase 1 involved reviewing Park bear observation records from 1980 through 1984 and identifying and accurately mapping grizzly/human confrontation sites. Analyses of plot data collected at confrontation sites revealed distinct seasonal shifts in habitats. These shifts were closely correlated with bear feeding habits. Discriminant function analyses separated confrontation sites from non-confrontation sites with an overall accuracy of 64%. When confrontation sites were grouped seasonally and then compared to non-confrontation sites, the prediction accuracy increased from 64% to as high as 86%. Fewer than 6 variables were used by the function to separate the classes, allowing for ease in identifying potential hazard areas in the field. In addition, sight distance and distance to water at confrontation sites was found to be significantly less ( $p < 0.001$ ) than the random sample. Phase 2 involved analyses of trends in observations, confrontations and bear-caused human injuries from 1980-1984. Observation records were shown to reflect fluctuations in age/sex class representation in the population between years, and in management areas with varying degrees of human use. A pulse in female productivity was noted and a consequent increase in subadult sightings occurred 2 years later. This pulse suggests synchronous breeding seemingly correlated to good and poor productivity in huckleberry crops. Females with young comprised a larger proportion of the age/sex classes observed off trail and were inversely correlated with human visitation. Subadults proportionally increased in areas with greater visitor use. The distribution of bears in relation to visitors suggests a hierarchical arrangement with the more dominant bears and productive females selecting areas away from human disturbance. Hikers confronting bears off trail were more likely to be injured than hikers on low- and especially high-use trails, suggesting increased hiker safety near habituated and less dominant bears. Phase 3 involved nocturnal movements of habituated grizzlies in a campground situation. Grizzlies used the trails and investigated areas near the campground more frequently at night than during the day. Bears consistently avoided the campground when people were camped there but frequently travelled through the campground when campers were absent. Females with young more frequently investigated the area at night than during the day, suggesting temporal resource partitioning in response to predictable use.



Grizzly bears in Glacier National Park used trails and investigated areas near campgrounds more frequently at night than during the day. When confrontation sites were grouped seasonally and compared to non-confrontation sites, prediction accuracy was as high as 86%.

Photo by  
Werner Stebner



Social factors associated with crowding appeared to be the major cause of nest abandonment by Canada geese on an irrigation reservoir in northwestern Montana. Virtually no abandonment occurred on single-nest islands, but 16% of the nests on multiple-nest islands were abandoned.

Photo by John J. Craighead



## ABSTRACT

Sovey, Sally J., M.S., Fall 1986

Wildlife Biology

Breeding Ecology of Canada Geese on an Irrigation Reservoir  
in Northwestern Montana

Director: I. J. Ball

Breeding ecology of Canada geese (Branta canadensis moffitti) was studied on Ninepipe National Wildlife Refuge during 1984 and 1985. The study was initiated in response to management concerns about declining productivity: nest abandonment rates exceeded 20% on Ninepipe in the early 1980's, far higher than elsewhere in the Flathead Valley. Suspected causes included social or territorial conflicts among the geese, interspecific interactions with nesting ring-billed or California gulls, and fluctuating water levels. Of 167 nests established in 1984 and 1985, 18 (11%) were abandoned. Detailed behavioral observations totalling 750 hours were obtained on a subset of 69 nests, 5 of which eventually were abandoned. Social factors associated with crowding appeared to be the major cause of nest abandonment. Virtually no abandonment occurred on single-nest islands, whereas 16% of the nests on multiple-nest islands were abandoned. Most abandonment occurred early in the nesting cycle, and relatively low clutch size suggested that young geese may have been involved. Gulls, great blue herons, and double-crested cormorants had no detectable influence on nest abandonment by geese. Fluctuating water level had no influence on nest abandonment, but was a major determinant of overall nest success. Following the nesting phase, examination of brood survival and behavior was necessary to document overall productivity on Ninepipe. Survival of goslings was compared for members of gang broods and normal broods, and creche behavior was examined. Locations in relation to habitat use and activities were recorded during 951 individual brood observations, marked adult observation, and 155 goose dropping transects. Data indicated at least 80% of the goslings survived to fledging regardless of brood composition. Gang brooding did not appear to influence survival, but approximately 90% of the broods observed were recorded as members of a creche at some time during the brooding period which may indicate some survival benefit. Locations of broods were closely associated to the availability of vegetated mudflats which were preferred areas for feeding and loafing. Surrounding grassland transects reflected the preference for mudflats and showed a decrease of use as the distance from water increased.



# ABSTRACT

Wegge, Per, Ph.D., November 1985

Forestry

The Sociobiology, Reproduction, and Habitat of Capercaillie, Tetrao urogallus L., in southern Norway (145 pp.)

Director: Bart W. O'Gara

During the declining phase of a local population fluctuation, composition of 62 capercaillie broods showed a significant preponderance of female chicks surviving until autumn. The distorted sex ratio was most pronounced among small broods. Due to high sexual dimorphism in chick growth, I inferred that differential mortality was caused by inadequate food. During the breeding season, most hens visited only one lek for mating and returned to this lek and the same nesting area in subsequent years. Their premating home ranges of 31-122 ha overlapped. After mating, hen home ranges decreased to about 20 ha and were largely exclusive. Nesting areas were widely spaced and located independent of the lek of mating and of the spring territories of cocks. All nesting territories included forested bogs, which received frequent use during a short period before egg-laying, presumably for selective feeding on emerging flower buds of bog cottongrass (Eriophorum vaginatum). Radiomarked hens did not select specific sites for nesting, and nest loss was unrelated to habitat type, forest stocking density, and nest cover. Spacing of nests through territorial behavior and random location of nests within territories may have evolved to minimize egg loss to predation. During spring, adult cocks established day-time territories of about 30 ha, which extended radially a maximum 1 km from the lekking ground. Yearlings and 2-year-old cocks were non-territorial and visited two or more leks during the season. When settling at one lek at the end of their second breeding season or as 3-year-olds, they were established further from the lek center than older cocks. Among the latter, no difference was noted in territory size between breeders and non-breeders. Once settled at a particular lek, cocks returned to this lek and the same territory in successive years, not changing site of occupancy when vacancies were created by deaths among older birds. Cocks showed a strong preference for mature, largely undisturbed forest, and territory size varied inversely with the relative proportion of such habitat. Thus, number of cocks per lek (i.e., lek carrying capacity) increased with the relative amount of mature forest within a 1 km radius of lek centers. Leks (N=46) in two study areas were both regularly spaced at a mean minimum distance of about 2 km, corresponding to the territorial space occupied by cocks of neighboring leks. From this, and the restricted movements of hens, I inferred that spacing of leks may have evolved in response to the territorial behavior of males, and not females, as recently proposed by other workers. Average winter activity of about 3 hours/day among 16 radiomarked birds showed a bimodal, alternans pattern with hens being about 26% more active than cocks during midwinter. Increased activity in late winter was associated with territorial behavior (males) and selective ground feeding (females).

## RESEARCH PROJECTS

### Physiologic and Ecologic Studies of the Pronghorn (Antilocapra americana)

Project Leader: B. W. O'Gara

Cooperators: National Bison Range, U.S. Fish and  
Wildlife Service; and the Montana Fish,  
Wildlife and Parks Department

#### Objectives:

##### To study:

1. the reproductive physiology of male and female pronghorn;
2. the physiology and function of scent glands;
3. food habits related to changes in range conditions;
4. horn growth and casting; and
5. the relationships of pronghorns to other artiodactyls.

#### Results:

Seven chapters for the Wildlife Management Institute pronghorn book are ready for the editor. Work continues on four others.

### Grizzly Bear Habitat Use, South Fork of the Flathead River, Montana

Project Leader: L. Jack Lyon

Field Investigators: D. A. Hadden, H. Carriles, and L. Klassen

Cooperators: U.S. Forest Service, Forest Sciences  
Laboratory, Missoula, Montana

#### Objectives:

1. Determine whether grizzly bear use of community types is accurately predicted by food plant cover (abundance), diversity, or some other criteria or combination of criteria.
2. Determine whether the analysis of the interspersation and juxtaposition of community types (based on habitat type by community type by successional stage stratification) enhances the predictive capability of a habitat use model.

#### Results:

This project has been funded for the 1986 field season. Results are expected in January 1987.

### Duck Banding in Canada

Project Leader: I. J. Ball  
Student Technicians: Varies, 4 to 6 annually

#### Objectives:

1. Trap and band 2000 mallards and up to 1500 pintails and 1000 of each of the other species available. This quota will be sought at each of 10 banding stations.
2. Maintain accurate records and provide summary reports from each station to the Migratory Bird Management Office.
3. Provide students from the Montana Cooperative Wildlife Research Unit with training in waterfowl research techniques and an ecological perspective that can only be obtained through on-the-ground experience.

#### Results:

Vary annually. Detailed annual reports are available.

### Beaver Populations on Impounded and Unimpounded Rivers: Densities, Habitat Profiles, and Mitigation Strategies

Project Leader: B. W. O'Gara  
Student Investigator: R. Bown  
Cooperator: Montana Power Company

#### Objectives:

1. Determine beaver population levels and patterns of habitat use on the Carter Ferry study area.
2. Compare population densities on impounded and unimpounded river segments.
3. Develop a "profile" of occupied habitat along impounded and unimpounded river segments.
4. Predict the effects of anticipated water levels on the availability of potential beaver habitat after completion of the Carter Ferry Dam and identify possible mitigation measures.

#### Results:

Field work has been completed. Student investigator is currently analyzing data and writing thesis.

The Yaak Moose: Habitat Relationships  
and Population Status

Project Leader: L. Metzgar

Student Investigator: B. Costain

Cooperators: Montana Department of Fish, Wildlife and  
Parks; Louisiana Pacific Corporation; J. E.  
Davis; Kootenai National Forest

Objectives:

1. Document habitat selection by moose in the Yaak River drainage and identify habitat components of significance.
2. Delineate seasonal movements and home ranges.
3. Estimate population densities and productivity.
4. Assess the impact of human activities—logging and hunting in particular—on these first three groups of parameters.
5. Develop guidelines that integrate timber stand manipulation with moose habitat management, and suggest ways of monitoring population trends.

Results:

Full-time fieldwork was completed in November 1985. Of the eight radio-collared moose (six cows, two bulls) followed during the last 2 years, five remain in the study area. Two collared cows and one bull were shot during the fall hunting season (two legally, one illegally).

During the past winter, a part-time volunteer obtained 60 radio locations and sightings of collared moose, observed habitat use patterns, checked calf survival, and monitored snow conditions. Our final data bank consists of 1180 radio locations, complete habitat descriptions for 690 sites, 350 fortuitous sightings for population estimates, 23 continuous 24-hour monitoring sessions, and snow depth and hardness measurements for three winters.

These data are now being assembled into six computer files, a process that will continue into the summer. Analysis of data and writing will proceed through the fall, and a report is expected by the end of 1986.

River Otter Population Status and Habitat  
Selection in Northwestern Montana

Project Leader: L. Metzgar

Student Investigator: A. E. Drunkert

Cooperators: Montana Department of Fish, Wildlife and  
Parks

Objectives:

1. Document the distribution of river otters on northwest Montana waterways.
2. Identify and map habitat for otters on northwest Montana waterways.
3. Quantify habitats used by otters in the Flathead River basin.
4. Determine otter population size in the Flathead River basin.
5. Model the effects of harvest on river otters in northwest Montana.

Results:

Waterways in northwest Montana were surveyed for otter sign and classified by habitat characteristics during Fall 1985 and Summer 1986. River otter sign was infrequent on all waterways but the greatest amounts were found in the Flathead River basin. Surveys of trappers and fishermen were conducted to supplement otter distribution information.

Radio-transmitters have been received and live-trapping for otters is underway on the Flathead River. Radio-locations will document otter movements in relation to riparian vegetation, habitat created by beavers, stream characteristics, water fluctuations, and migratory game fish populations.

A preliminary model of the effects of harvest on the otter population in the Flathead basin has been completed. Density information from radiotelemetry and mark-recapture will further refine this model.

India Mountain Project

Project Leader:	B. W. O'Gara
Field Biologists:	J. Fox, S. P. Sinha, R. Singh, and P. Das
Wildlife Officers:	N. Ahmad, C. Riggin, M. Raza
Logistics Consultant:	A. Chondola
Cooperators:	Wildlife Institute of India; International Snow Leopard Trust

Results:

The ongoing field survey is a demanding project because the snow leopard is elusive and because of the special characteristics of the mountain habitat it occupies: the rugged mountainous terrain; the rarified, high-altitude environment at elevations of 15,000 to 19,000 feet; the extreme and unpredictable climatic

conditions of the Himalayan winter; the danger from avalanches and falling rocks; and the remoteness from human habitation.

Field work was initiated during early November 1985. Fox and three Indian research fellows were accompanied to the initial field site by Mr. H. S. Panwar, Director of the Wildlife Institute of India, and Mr. Alok Chandola, coordinator of logistics for the project. Three wildlife officers from the Jammu and Kashmir Department of Wildlife Protection joined the research crew.

The first phase of the survey was completed on 24 January 1986. After a 3-week break, the team returned to Leh in the second week of February. Fox, along with other team members, arrived at New Delhi on 1 April 1986, when the final phase of the survey began in the states of Uttar Pradesh and Himachal Pradesh. The survey activities in these two states are expected to be completed during July 1986.

In a report from Markha Valley, Jammu and Kashmir, Fox reported snow leopard observation for approximately 20 daylight hours during 7-9 March 1986. The snow leopard sighted was an adult female. The project personnel were able to view the animal and take photographs.

#### Elk-Cattle Interactions on the Wall Creek Allotment

Project Leader: B. W. O'Gara  
Student Investigator: S. J. Gniadek  
Cooperator: U.S. Forest Service, Forest and Range  
Experiment Station  
Objective:

Evaluate habitat relationships between cattle and elk.

#### Results:

Two field seasons have been completed and analysis of observation and transect data is nearly complete. Most cattle use was in meadows and most cattle use of forest was on the edges. Use of cover types by elk did not appear influenced by cattle. However, elk segregated from cattle by elevation and slope. Elk appeared to tolerate cattle in a pasture or in a portion of a pasture only in low densities. Elk use declined in all pastures grazed by cattle, and was greater in rested pastures and pastures yet ungrazed than in pastures grazed by cattle. Elk use increased in some pastures following removal of cattle.

Closing of gates following cattle rotations between pastures permitted elk to reuse pastures after cattle grazing. Gates left open after rotations, allowing cattle simultaneous use of more than one pasture, limited reuse by elk.

Completion of data analysis and thesis writing is expected in autumn 1986.

An Evaluation of Elk-Livestock Interactions  
in Central Idaho

Project Leader: B. W. O'Gara  
Student Investigator: S. P. Kratville  
Cooperators: Idaho Department of Fish and Game; U.S.  
Forest Service; Bureau of Land Management

Objectives:

1. Document movements of radio-marked elk in relation to cattle distribution on spring, summer, and fall ranges.
2. Determine habitat use by radio-marked elk in relation to cattle distribution on spring, summer, and fall ranges.
3. Compare the nutritional well-being of elk subjected to livestock disturbance with that of undisturbed elk (DAPA method).
4. Develop year-round DAPA profiles for the wintering elk herd at Willow Creek Summit.

Results:

Twenty-two aerial surveys conducted during 1985 resulted in 467 locations from 24 radio-collared elk. Twenty pellet collections were made from June-December of 1985. Pellet collections have been analyzed for DAPA (diaminopimelic acid) levels. The student investigator will be conducting the second field season June-October 1986. Aerial surveys, pellet collections and analysis, and habitat typing will be continued.

Management Plans for Wild Artiodactyles in  
Northwest Frontier Province, Pakistan

Project Leader: B. W. O'Gara  
Student Investigator: Muntaz Malik  
Cooperator: UNESCO

Progress:

The student completed 3 quarters of course work at the University of Montana and then returned to Pakistan where he will spend 3 months gathering data for his professional paper.



Ecology of Bobcats in Southeastern Idaho Relative to Human  
Exploitation and a Black-tailed Jack Rabbit Decline

Project Leader: I. J. Ball  
Student Investigator: S. T. Knick  
Cooperators: U.S. Department of Energy, U.S. Fish and  
Wildlife Service, Idaho Department of Fish  
and Game

Objectives:

1. Determine the effects of harvest on bobcat populations.
2. Document bobcat responses to a black-tailed jack rabbit population decline.

Results:

Fieldwork for the bobcat project at the Idaho National Engineering Laboratory (INEL) was completed in December 1985. The student investigator has continued coursework in the Department of Zoology. Anticipated completion date of all degree requirements is Fall Quarter 1986. Data analyses and publication writing are currently in progress. Much effort has been involved in the development of a computer simulation of bobcat populations for the purpose of testing various harvesting strategies. The computer simulation incorporates both the temporal characteristics of natality and mortality schedules as well as the spatial attributes of dispersal and social organization of bobcat populations. The model is derived from information gained from the 4 years of this study and 3 years of a previous study by Dr. Ted Bailey that have resulted in data on 108 marked bobcats. Model outputs are bobcat population responses to varying harvest strategies.

One female, marked as a yearling in spring 1982, was recently found dead in an illegally set snare. This female, now 4.5 years old, is the oldest known-aged specimen in this study that has been recovered and will be used to test the aging technique of counting canine cementum annuli.

Daily Survival Rates, Movements, and Habitat Use  
of Mallard Broods on Benton Lake NWR

Project Leader: I. J. Ball  
Student Investigator: D. I. Orthmeyer  
Cooperators: Benton Lake NWR, U.S. Fish & Wildlife  
Service--Region 6

Objectives:

1. Determine daily survival rates of mallard ducklings.
2. Determine habitat preference of mallard broods.
3. Determine brood movement patterns.

Results:

During the first year of the project, the student captured and radio-marked 16 adult female mallards while they were nesting. Ten hens hatched nests and 6 of those 10 fledged broods. Visual observation of broods and radio locations were mapped throughout the spring and summer of 1985. During 1986, 25 hens hatched nests, and 23 of these were tracked during part or all of the broodrearing period. Two newly hatched ducklings were marked with experimental radio packages and were tracked successfully. Data analysis and manuscript preparation will begin in September 1986, with project completion in spring 1987.

Nest Success of Upland-Nesting Ducks  
in the Flathead Valley

Project Leader: I. J. Ball  
Technicians: N. Hall and J. Iord  
Cooperators: USFWS, National Bison Range

Objectives:

1. Document nest success of upland-nesting ducks on refuge and WPA lands in the Flathead Valley.
2. Compare nest success among species and cover types.
3. Identify general causes of nest failure and predator species where possible.
4. Provide experience for undergraduate wildlife students in gathering and interpreting duck nest success data.

Results:

Three repetitions of nest drags were completed on approximately 800 acres of nesting habitat, and all nests were revisited to determine success. Data analysis and report preparation are underway. A decision on whether to repeat the surveys in 1987 is pending.

Canada Goose Nesting and Broodrearing in Relation  
to Water Levels in the Flathead Valley

Project Leaders: I. J. Ball and J. J. Claar

Cooperators: Confederated Salish and Kootenai Tribes,  
Bureau of Indian Affairs, Bonneville Power  
Administration

Project Biologists: D. Mackey, S. Gregory, and B. Matthews

Tribal Technicians: K. Clairmont and B. Swaney

Objectives:

1. Document goose production on lower Flathead Lake and River.
2. Determine population impacts of providing additional secure nest sites for geese along the River.
3. Develop techniques and guidelines that maximize effectiveness of nest structure management programs, while minimizing costs. Experiment with nest materials to minimize deterioration and loss. Target:  $\geq$  5-year intervals between maintenance visits.
4. Analyze physical and vegetation characteristics of nest sites.
5. Describe habitat selection by goose broods and relate it to water fluctuations on the study area.
6. Document the location of key goose brood rearing areas.
7. Describe the physical and vegetation characteristics of brood rearing areas.
8. Identify potential brooding areas that could be managed to maintain and improve brood habitat.
9. Record river water levels at key brood rearing areas when broods are present and relate these levels to releases from Kerr Dam.
10. Formulate any management recommendations necessary to protect and enhance brood habitat.
11. Document historical trends in availability of brood habitats.

Results:

Four field seasons have been completed, with a partial field season scheduled for spring 1986. Comprehensive annual project reports are available on request. Data analysis and preparation of manuscripts is underway.

Wildlife Conservation and Management Training  
Program, Peshawar, Pakistan

Project Leader: B. W. O'Gara

Personnel: L. Metzgar, D. Pletscher, C. Knowles,  
P. Knowles, R. Eng, R. Greene, S. Olson-  
Edge, D. Edge

Cooperators: Pakistan Forest Institute; Zoological  
Survey of Pakistan; U.S. Fish and Wildlife  
Service, Office of International Affairs;  
Department of Forestry, Baluchistan

Results:

A 1-month school, attended by 30 personnel from the Zoological Survey and four provincial game departments, was held at the Pakistan Forest Institute during October and November 1985. R. Greene toured Pakistan to advise on game-bird propagation and Metzgar is spending the summer in Pakistan working with various biologists to standardize census techniques throughout the country. Plans are underway for training programs in Baluchistan during March 1987.

Ecology of Bald Eagles Wintering Along the  
Columbia River in South-Central Washington

Project Leader: I. J. Ball and B. R. McClelland

Student Investigator: S. A. Eisner

Cooperators: Northwest College and University  
Association for Science; U.S. Department of  
Energy; and Battelle, Pacific Northwest  
Labs

Objectives:

1. Identify perching, foraging, and nocturnal roost sites.
2. Describe the environmental conditions at used and non-used sites.
3. Compare environmental conditions at used and non-used sites in order to make inferences about the factors that influence eagle use.
4. Measure activity levels of Bald Eagles, by age classes, at foraging and nocturnal roosting sites.
5. Compare foraging and roosting activity levels to make inferences about communal roosting behavior.

## Results:

Field work was initiated on 2 January 1986 and continued through March 1986 on a 131-km stretch of the Columbia River, which includes the Hanford National Environmental Park, Priest Rapids Dam and Reservoir, and a part of the city of Richland, Washington. Weekly aerial surveys were flown to identify use areas, which were relatively concentrated on specific river sections. Data on selected factors of various environmental conditions--human activity, topography, river flow, vegetation, and prey--were also collected. Ground and aerial surveys were made to locate three major communal night roosts, where Bald Eagles were censused and behavior observed.

Preliminary data analysis will proceed through late summer into early fall. A full, and final, winter field season will be conducted from October 1986 through April 1987.

### Ecology of Sind Ibex and Urial in Kirthar National Park, Pakistan

Project Leader: B. W. O'Gara

Project Biologists: D. Edge, S. Olson-Edge, and N. Shani

Cooperators: Sind Wildlife Management Board; Kirthar National Park, Pakistan; U.S. Fish and Wildlife Service, Office of International Affairs

## Results:

The base of operations has been moved to Karchat Center in Kirthar National Park. The biology and behavior of wild goats (*Capra aegagrus*) and urial (*Ovis orientalis*) at a waterpoint were studied from 21 March to 21 May 1986. The waterpoint was observed for 416 hours during 32 days. Thirty-four wild goats and eight urial were captured and marked for individual identification. Average group sizes of wild goats and urial were 18.8 and 3.8. Only 49% of the wild goat and 36% of the urial groups that approached water actually drank. The mean number of wild goats visiting the waterpoint per day increased from March through May. Wild goats showed no preference for time of day during which they visited the waterpoint, but the majority of urial visits occurred during late afternoon and early evening. Waterpoints that are developed in arid regions to benefit wild goats and sheep should have reservoirs that provide sufficient water under drought conditions. The security of the two species should be considered when locating water developments.



A trophy class Sind ibex in Kirthar National Park, Pakistan.

Photo by Dan Edge



A mature urial ram captured at a water hole with a netgun. These desert animals will drink water even while they are hog-tied and blindfolded.

Photo by Dan Edge

Analysis and Modeling of Grizzly Bear  
Population Trends

Project Leader: L. H. Metzgar

Research Biologist: R. B. Harris

Objectives:

1. Determine the accuracy and precision of calculations of grizzly bear harvest rates from age-related changes in harvest sex ratios.
2. Develop a flexible version of a stochastic grizzly bear population simulator for use on microcomputers.
3. Determine sustainable yields for modeled grizzly bear populations.

Results:

Work has been completed on Objective 1 and an article, currently under review, submitted to the Journal of Wildlife Management. Modeling system GAPPs (Generalized Animal Population Projection System) has been completed. A user's manual is currently under review. Sustainable yields have been determined for modeled grizzly bear populations and an article is under review at the Journal of Applied Ecology.

Toxicity of Bromadiolone-Poisoned Columbian Ground  
Squirrels to Red-Tailed Hawks and Great Horned Owls

Project Leader: B. W. O'Gara

Contract Investigators: J. S. Dahlke and J. C. Malloy

Cooperators: Chempar Products Division of Lipha  
Chemicals, Lindbergh Cattle Company,  
Montana Department of Agriculture,  
Community Medical Center

Objectives:

1. Determine the toxicity of ground squirrel carcasses containing known amounts of bromadiolone to captive Red-tailed Hawks and Great Horned Owls.

Results:

Ground squirrels have been captured and dosed with bromadiolone. Seventeen of the 20 necessary raptors have been acquired. The project will be completed in the fall of 1986.



Black Bear Ecology and Observability Rates  
In the Yaak River Drainage, Montana

Project Leader: B. W. O'Gara  
Student Investigator: T. J. Thier  
Cooperators: Montana Department of Fish, Wildlife, and  
Parks; J. E. Davis; Kootenai National  
Forest

Objectives:

1. Determine bear densities within the study area.
2. Determine and compare home range sizes of adult male and female black bears.
3. Determine and compare the activity patterns of adult male and female black bears.
4. Determine and compare the observability rates of each sex and age group.

Results:

During the spring trapping effort, 16 individual black bears were captured and marked. Of these, 11 were adult males and 2 were adult females. Both adult females and 5 of the adult males were instrumented with motion-sensitive transmitters.

Of the instrumented bears, 1 male and 1 female moved south and west into Idaho with the onset of the berry season. After several weeks, both returned to the study area. The remainder of the instrumented bears have remained in or near the study area.

Intensive 24-hour monitoring of the instrumented bears is currently being conducted. One to 7 locations are being obtained on each bear/week. Preliminary results of the 24-hour monitoring reveal little or no movement by the instrumented bears during periods of full darkness, and considerable movement during mid-day. Periods of greatest activity are early morning and late afternoon.

Trapping will resume in late August and continue through mid-September. At that time, the student will return to U of M to continue coursework. Fieldwork will resume in April of 1987 and continue until September. It is expected that the thesis will be completed by March of 1988.

## Mule Deer Use of Upper Missouri River Breaks Habitat in Central Montana

Project Leader: B. W. O'Gara  
Student Investigator: S. K. Kraft  
Cooperators: Montana Power Company; Montana  
Department of Fish, Wildlife and Parks

### Objectives:

1. Determine distribution, habitat use, and movement patterns of mule deer on lands adjacent to the proposed Carter Ferry Hydroelectric Project.
2. Evaluate habitat quantity, quality, and intensity of use.
3. Assess potential impacts of the project on mule deer and deer hunting opportunities.

### Results:

The student's thesis is being written in manuscript format with three of four chapters suitable for publication. An introductory chapter and a chapter on use of agricultural lands by mule deer have been completed and approved by committee members. Data analysis for the remaining chapters on habitat selection and potential impacts of hydroelectric development has been completed. The student will defend her thesis this Fall quarter and the abstract will appear in the next Annual Report.

The student worked winter quarter illustrating a Wildlife Management Institute book on pronghorn antelope, and worked as a crew leader for the USFWS on the Canada Cooperative Duck Banding Project again this summer.

## Nesting Structures for Mallards and Canada Geese: a Handbook

Project Leader: I. J. Ball  
Research Assistant: S. K. Kraft  
Research Cooperator: F. B. Lee  
Cooperators: USFWS: Division of Refuges, Region 6,  
Region 4, and CUC Extension

### Objective:

Produce a practical handbook on the use of waterfowl nesting structures that will allow managers to make informed decisions about structure design and placement that will maximize effectiveness, durability, aesthetic appeal, and nest security, and minimize construction and maintenance costs.

### Results:

Literature review completed. Remainder of project is underway. Final report will appear in next Annual Report.

Population Status, Distribution and Habitat  
of the Beaver in Northwestern Montana

Project Leaders: L. Metzgar and D. Pletscher  
Student Investigator: A. L. Easter-Pilcher  
Cooperators: Montana Department of Fish, Wildlife and  
Parks

Objectives:

1. Determine population status and relative densities of beaver populations within diverse habitats on selected rivers and lakes in northwestern Montana;
2. Develop a general beaver habitat classification scheme for lacustrine and riverine habitats in northwestern Montana;
3. Quantify beaver sign indices and determine their utility in predicting colony size and population density;
4. Discriminate use/non-use data with habitat variables to weight the importance of those variables;
5. Correlate developed habitat classification types to colony size and population density;
6. Develop a deterministic model of beaver population growth that includes allowable harvest rates for a sustained annual yield.

Results:

General habitat and population sampling of 550 miles of waterway was initiated on 1 July 1985 and completed on 31 August 1986 (July - October 1985 and June - August 1986).

Beaver population densities and colony size will be determined through visual observation of individual lodges and bank dens during a two week period at the end of October, 1986. Sample size has been set at ten colonies for each of three qualitatively different habitat types. The selected areas of population sampling have been tentatively defined as the Clearwater and Swan rivers and Fish Creek. Specific stretches and individual dens to be observed will be determined and marked on aerial photos and on the ground in early September.

Intensive habitat sampling of the specific study sites will take place in September, October and November. Quantitative measurements to obtain continuous data will be taken for the critical habitat variables and the sign indices at each lodge/den site as well as at random sites.

Live-trapping and/or time lapse photography will be used at selected den sites within each habitat type in early November. Live-trapping or photography will serve to validate the age structures and numbers previously determined through visual observations.

Trapper cooperation has been sought and tentatively given to provide biological data on those animals trapped out of the specific study sites.

The student investigator will be involved in data analyses and thesis writing through the winter of 1986 and the spring of 1987.

#### Population Genetic Structure of Westslope Cutthroat Trout

Project Leader: Fred W. Allendorf  
Student Investigator: Robb F. Leary  
Cooperator: Montana Department of Fish, Wildlife and  
Parks  
Objective:

Determine the population genetic structure of westslope cutthroat trout native to the waters of Montana.

#### Results:

Alteration of the environment and interbreeding with introduced rainbow, Salmo gairdneri, and Yellowstone cutthroat trout, S. clarki bouvieri, has resulted in the loss of many populations of westslope cutthroat trout, S. c. lewisi, native to the waters of Montana. Preservation of the westslope cutthroat trout is now a primary goal of the Montana Department of Fish, Wildlife and Parks.

Starch gel electrophoresis was used to determine the population genetic structure of the westslope cutthroat trout. The data indicate the 33% of the total amount of genetic variation detected is attributable to genetic differences among the populations. Since a single population appears to contain only a relatively small proportion of the total amount of genetic variation in this subspecies, preservation requires ensuring the continued existence of many populations. Furthermore, in order for a hatchery strain to serve as a storehouse of the genetic variation in westslope cutthroat trout genetic material from many populations must be incorporated into the strain. The Montana Department of Fish, Wildlife and Parks has incorporated these guidelines into its plans concerning the preservation of the westslope cutthroat trout.

Effects of Motorized Road Use on Grizzly Bear  
Behavior, Habitat Use, and Reproductive Success

Project Leader: B. W. O'Gara

Technicians: B. N. McLellan

Cooperators: U.S. Fish and Wildlife Service, Region 6,  
Grizzly Bear Recovery Coordination Office

Objective:

Assess effects of road use on grizzly bears.

Results:

The study of the effects of roads and motorized road use on grizzly bear behavior and habitat use continued in 1986. The study area is on the Canadian side of the U.S./Canadian border on the North Fork of the Flathead River immediately northwest of Glacier National Park in an area of intensive road use for forestry and oil and gas development activities. The purpose of this study is to document the behavioral response of grizzly bears to roads and road use. A report on the cumulative efforts from 1979 to 1985 is now in final draft having been reviewed by the Recovery Coordinator twice. It will be submitted for publication to the Journal of Wildlife Management by the end of 1986. Studies are planned to continue in this area to substantiate theories about the long term response of bear populations to high levels of human disturbance.

Pronghorn Antelope Behavior in Northwestern  
Nevada-Southeastern Oregon

Project Leader: B. W. O'Gara

Student Investigator: J. O. Meeker

Cooperators: Sheldon-Hart National Wildlife Refuge,  
Double Four Corporation, NRA

Objectives:

1. Determine seasonal movements of pronghorns that summer on Hart Mountain and Sheldon refuges.
2. Determine breeding strategies used by pronghorn with home ranges in different habitat types.
3. Determine selected trace element content of vital organs and hair of pronghorn taken at Hart Mountain and Sheldon refuges.
4. Compare Hart-Sheldon trace element data with hair taken from Idaho and Montana pronghorns.

## Results:

Some analysis of data continued during the reporting period. A Final Report will be prepared during the coming winter and submitted in the summer of 1987.

### Rocky Mountain Trumpeter Swan Project

Project Leader: I. J. Ball

Research Associate: R. E. Gale

Cooperators: U.S. Fish and Wildlife Service, Region 6;  
Montana Department of Fish, Wildlife and  
Parks; Idaho Fish and Game; Wyoming Game  
and Fish; The Trumpeter Swan Society

## Objectives:

Utilize available published and unpublished information to produce a scientific document on Trumpeter Swans of the Rocky Mountain Population that is suitable for use by managers and for publication.

## Results:

A first draft of the monograph has been completed. Quantity and quality of data was excellent, and the analysis provides major new insights into factors that influence recruitment and mortality of trumpeter swans. The project has been extended for 9 months to allow for integration of contributions by cooperators and development of the final manuscript. The project summary will appear in the next annual report.

### Distribution, Ecology, and Management of Wolves in Northwest Montana

Project Leader: R. R. Ream

Technicians: M. Fairchild and D. Boyd

Cooperators: U.S. Fish and Wildlife Service; Montana  
Department of Fish, Wildlife and Parks

## Objectives:

1. Describe the distribution and status of wolves in northwest Montana.
2. Determine food habits and movements of wolves in a colonizing wolf population.
3. Determine what factors may be limiting wolf recovery in northwest Montana.
4. Provide management recommendations for the recovery of wolves and resolution of wolf-human conflicts.

## Results:

Five wolves were trapped and radio-collared on six occasions during the report period. Two of the wolves immediately dropped their collars, but a previously radio-collared wolf brought the number of wolves successfully radio-collared and tracked to four (3 females, 1 male).

In 1985, seven wolf pups were successfully reared in the North Fork of the Flathead, British Columbia, bringing the number of wolves in the Magic Pack to 13. One wolf, probably from this pack, was found dead from human causes in October 1985, decreasing the pack size to 12 wolves. In November 1985, this pack moved its center of activity south into Glacier National Park, Montana. Pack size dropped to eight in February 1986, but none of the four wolves which apparently split off wore radios so their location and status remain unknown. The pack remained in Glacier National Park into the breeding and denning seasons where they weaned five pups.

Male wolf, W8401, spent most of summer and fall 1985 in British Columbia but returned to Glacier National Park for winter 1985-86. Although he was known to be with at least one other wolf as late as November 1985 and again in June 1986, he was alone throughout the winter and did not successfully breed in 1986. His summer 1986 activity center is again British Columbia.

A random sample of five hairs was identified from each scat collected from the Magic Pack and W8401. Moose was the primary prey species found in Magic Pack scats from the winter of 1984-85 when the pack restricted its movements primarily to the B.C./U.S. border area and northward. White-tailed deer and elk were the secondary and tertiary prey species, respectively. After the Magic Pack shifted its home range southward into Glacier National Park, white-tailed deer, mule deer, and elk were represented in scats in that order. Moose were an insignificant portion of the winter 1985-1986 prey taken.

Most wolf reports received outside of the North Fork of the Flathead area were on the east side of Glacier National Park, but reports also were received from the Swan/South Fork Flathead, northwest Montana, and Middle Fork Flathead areas.



## Kerr Dam Wildlife Studies

Project Leaders: J. J. Claar and I. J. Ball

Project Biologists: D. Becker, C. Mack, P. Mullen, and  
K. Murphy

Cooperators: U.S. Bureau of Indian Affairs, Confederated  
Salish and Kootenai Tribes

### Objectives:

1. Determine the effects of the Kerr Project on bald eagles and ospreys
  - a. hunting success,
  - b. feeding site selection,
  - c. food habits, and
  - d. reproduction.
2. Document distribution of furbearer species along the river and the lake.
3. Correlate furbearer distribution with riparian vegetation types and other factors.
4. Estimate relative abundance of furbearer species.
5. Determine effects of water level fluctuations on furbearers and habitat.
6. Formulate management and mitigation recommendations necessary to protect and enhance riparian habitat and furbearer population levels.

### Results:

Reproductive success and foraging activities were monitored at 57 active osprey nests and six active eagle nests. Preliminary analyses indicate that ospreys fledged about 2.1 young per active nest and eagles 1.5. Dive success was about 80% for eagles, with major prey species of suckers and perch. Ospreys were successful on about 70% of their dives, with major prey species of squawfish, suckers, and perch.

Sign surveys are being conducted for beaver, muskrat, mink, and otter on Flathead Lake and Flathead River below Kerr Dam. Effects of water levels on distribution, movements, and survival of muskrats and beavers are being investigated using telemetry implants.

CONSERVATION, EDUCATION, AND PUBLIC RELATIONS

Bart O'Gara, Unit Leader

- 7 October           Lectured and showed slides on carnivores of Montana to the Montana wildlife class (45 non-wildlife majors) for three hours.
- 23 October          Presented a slide lecture to Rotary Club on wildlife problems in Pakistan (about 30 Rotarians attended).
- 30 October          Lectured to the advanced wildlife management class on pronghorn management and habitat management for pronghorns (about 35 undergraduates).
- 5 November          Attended a half-day meeting of the gray wolf working group.
- 6 November          Collected a mule deer and necropsied it for the large mammal conservation class (about 35 undergrads).
- 8 November          Lectured for half day on drugging and capture techniques to large mammal conservation class (about 35 undergrads).
- 11-20 Nov.          Initiated and co-taught a 4-week training course for wildlife biologists in Peshawar, Pakistan. It was taught by Drs. Dan Edge, Lee Metzgar, Dan Pletcher, and Bart O'Gara, and Ms. Sally Olson-Edge from the University of Montana; Dr. Robert Eng from Montana State University and Dr. Craig Knowles and Mrs. Pam Knowles of Fauna West. Twenty-seven biologists from Provincial Wildlife Departments and the Zoological Survey attended the course. Several professors from the Pakistan Forest Institute attended part time.
- 4-5 Dec.            Visited Regional Office and participated in a meeting to set priorities for funding on gray wolves and preparing to control wolves if necessary.
- 14 January          Gave a slide program "Big game hunting around the World" to about 50 members of the Prickly Pear Sportsmen's Club in Helena, Montana.

31 January	Appeared on local T.V. to discuss USFWS/U.M. involvement in studies in Pakistan, India, and Nepal.
3, 11, & 21 February	Presented 6 hours of slide-assisted lectures on big game biology and management to a high school wildlife management class (45 students).
13 February	Organized and participated in an all-day training session on identifying wolf kills and trapping wolves (6 ADC agents, 2 biologists from wolf ecology project, and 2 FWS enforcement agents).
19 February	Gave a Zoology Department seminar on wildlife research and research opportunities in Pakistan (about 35 students and faculty).
3 March	Presented a slide program on African and Asian parks to the Park Management class at U.M. (20 graduate students).
4 March	Held a Northern Rocky Mountain Wolf Recovery Team meeting at U.M.
11-13 March	Attended the Pronghorn Workshop in Reno, Nevada, and presented a paper on "Effects of fawn activity and bedding cover on susceptibility to predation."
20 March	Reviewed a 16-page manuscript for Journal of Mammalogy.
21 March	Gave a slide-assisted lecture on hunting and game management in Africa and Eurasia to the Anaconda Sportsmen Club, Anaconda, MT (about 30 members).
1 April	Gave seminar on the Unit program and research projects at the MT CWRU at New Mexico State University, Las Cruces, New Mexico.
2 April	Gave Seminar at University of Texas in El Paso, Texas, on "Research and Training at the MT CWRU."

16 April	Participated in Natural Resource Council with Research Administration at the University of Montana, Missoula, Montana.
13-17 April	Attended the Annual Northern Sheep and Goat Conference in Missoula.
28 April	Lectured to an advanced microbiology class (12 students) on health problems in Morocco, Mongolia, Zimbabwe, and Namibia.
29 April	Lectured to an advanced wildlife class on predation on livestock and big game.
30 April	Reviewed a 33-page manuscript for The International Association for bear research and management and a 14-page manuscript for Science.
1 May	Attended an all-day session on research planning for the Wolf Ecology project.
12 May	Reviewed "The Pronghorn Story" for the Oklahoma University Press--266 pages.
14 May	Conducted an outdoor school for 5th graders (42 students) at Savinac Ranger Station.
15-17 May	Hosted 2 Chinese scientists from western China.
22 May	Attended a meeting of the Grey Wolf Oversight Committee in Missoula.
19 June	Attended NWF Land Committee meeting in Missoula.
30 June	Reviewed an 8-page manuscript for the Wildlife Bulletin.
10 July	Met with local sport hunting group at Fort Owen Inn, Stevensville, Montana, and discussed hunting options.
18 July	Reviewed an 9-page manuscript for the Wildlife Bulletin.
23 July	Inspected Grant Land/Wooten Estate burn area and investigated the possibility of controlled burns in the Upper Rattlesnake Valley.

Joe Ball, Assistant Unit Leader

- 30 September    Lectured to the advanced wildlife management class on waterfowl management (about 35 undergrads).
- 18 November    Lectured on waterfowl and upland game birds to Montana wildlife class (40 undergrads).
- 10 January      Met in Butte with U.S. Forest Service and Mont. Dept. Fish, Wildlife and Parks personnel to discuss a potential coop-ed student project.
- 14 January      Presented an overview of Canada goose research in the Flathead Valley to a BPA Project meeting in Spokane.
- 3 February      Refereed 18-page article for Journal of Wildlife Management.
- 13 February     Lectured to a U.M. Wildlife Careers class on USFWS.
- 13 February     Presented a film and lecture on the African Black Duck to the U.M. Student Chapter of the Wildlife Society (20 present).
- 24 February     Attended an FWS hearing on steel vs. lead shot.
- 27 February     Gave a talk at the Montana Chapter, TWS meeting in Billings on the Unit program and U.M. wildlife curriculum.
- 9 April          Attended the native American Wildlife meeting in Missoula, MT.
- 16 April        Attended a meeting of the University of Montana Research Administration and the Montana Natural Resources Council in Missoula.
- 3 June          Attended training session on steel shot in Helena.
- 16-17 June      Attended meeting in Lima, MT to meet with Red Rock lakes NWR Manager B. Reiswig and Unit Research Associate R. Gale regarding Trumpeter Swan Project.
- 23 June         Attended a meeting in Jamestown, ND to plan a cooperative test of mallard nest structures in SD, ND, and MT.

- 8 July                      Attended the Flathead Valley Canada Goose Committee meeting in Pablo, MT.
- 10 July                    Met in Jackson, Wyoming with Service and Flyway personnel to present findings of Trumpeter Swan Project.
- 8 August                  Refereed 14-page article for The Wildlife Society Bulletin.
- Developed study proposals (now funded) for the Central Flyway committee on Mallard nest structure tests and duck recruitment in eastern Montana.

"Ginger" Schwarz, Office Manager

- 11-16 Nov.                Attended Administrative Workshop for DCU Secretaries, Washington, D.C.

Virginia Johnston, Unit Secretary

- 11-16 Nov.                Attended Administrative Workshop for DCU Secretaries, Washington, D.C.

Kevin L. Berner

- 26 November              Presented thesis results to Student Chapter of The Wildlife Society.
- 8 January                Presented slide talks on white-tailed deer research to two Wildlife Biology classes at Sentinel High School in Missoula.
- 21 January                Presented paper on white-tailed deer research to the Regional Wildlife Workshop.
- 19 February              Presented a slide talk on wildlife field techniques to a Fisheries and Wildlife Techniques class at Cobleskill Agricultural and Technical College (State University of New York).

- 19 February Presented a slide talk on wildlife field work and employment opportunities to the Fish and Wildlife Club at Cobleskill Agricultural and Technical College (State University of New York).
- 27-28 Feb. Attended annual meeting of the Montana Chapter of The Wildlife Society.
- 20 March Attended NW Section meeting of The Wildlife Society in Coos Bay, Oregon, and presented a paper entitled, "Winter and spring habitat selection by white-tailed deer in a western Montana second-growth forest."
- 14-17 April Attended biennial meeting of the Northern Wild Sheep and Goat Council in Missoula.

Robin Bown

- 20 March Attended NW Section meeting of The Wildlife Society in Coos Bay, Oregon, and presented a paper entitled, "Of Beaver and Dams."
- 4 April Lectured to Interpretation in Recreation Areas class at University of Montana.
- 24 April Lectured in Wildlife 395 on Effects of Dams on the Environment.

Scott M. Brainerd

- 20 March Attended NW Section meeting of The Wildlife Society in Coos Bay, Oregon, and presented a paper entitled, "Reproductive ecology of bobcats and lynx in western Montana."

Brent Costain

- December Gave talk and slide presentation to Regional Game Managers meeting, Fish, Wildlife and Parks, Libby.
- February Gave talk and slide presentation to Sentinel High School wildlife biology classes.

Sherry Anne Eisner

- 7-10 October Attended the A.O.U. meetings in Tempe, Arizona.
- 9 April Attended the Native American Fish and Wildlife Society conference in Missoula, Montana.



Steve Gniadek

- 18 November      Presented slide talk on elk behavior to two Sentinel High School wildlife biology classes.
- 31 Jan.-2 Feb.    Accompanied University of Montana Mammal Conservation and Management class field trip to Yellowstone National Park; lectured on "Buffalo Ranch," bighorn sheep, and elk.
- 26 February      Attended Second Annual Montana Non-game Wildlife Symposium, Billings, Montana.
- 27-28 Feb.        Attended Annual Montana Chapter, The Wildlife Society meeting, Billings, Montana.
- 19 March          Attended Western States and Provinces Elk Workshop, Coos Bay, Oregon.
- 19-21 March        Attended Annual NW Section, The Wildlife Society meeting, Coos Bay, Oregon.
- 15-17 April        Attended International Wild Sheep and Goat Conference, Missoula, Montana.
- 3 June             Presented slide talk on elk-cattle relationships to University of Montana senior wildlife biology class.
- 23 June-  
August 15         Worked as teaching assistant in Ecology of Birds at the University of Montana Biological Station at Flathead Lake.

Susan Kraft

- 22 January        Attended regional workshop of the Montana Chapter of The Wildlife Society in Missoula, and presented a paper entitled, "Mule deer use of agricultural lands adjacent to Missouri River breaks habitat."
- 24 February        Attended an FWS hearing in Missoula on steel vs. lead shot.
- 20 March           Attended NW Section meeting of The Wildlife Society in Coos Bay, Oregon, and presented a paper entitled, "Mule deer use of agricultural lands adjacent to Missouri River breaks habitat."
- 11 April            Montana Science Fair judge.

24 April Presented a slide-show talk to Sigma Xi, on the potential impacts of hydroelectric development on mule deer in the Upper Missouri River breaks.

Sandy Kratville

7-8 March Attended Idaho Chapter of The Wildlife Society annual meeting in Boise, Idaho. Presented a paper on the Willow Creek Summit wintering elk herd.

23-26 April Attended 51st North American Wildlife and Natural Resources Conference in Reno, Nevada.

Steve Nadeau

October Presented lecture to University Chapter of The Wildlife Society entitled, "Glacier's bears--are campers safe?"

February Presented lecture to a senior wildlife biology class entitled "Comparative behavior of ungulates and carnivores."

March Presented lecture to University Chapter of The Wildlife Society entitled "Grizzlies of Glacier--a management dilemma."

April Presented a paper to the Montana State Chapter of The Wildlife Society entitled "Habitats and trail situations associated with grizzly/human confrontation in Glacier National Park."

April Presented lecture to Wildlife and Resource Management class on Glacier's grizzlies and bear management.

May Attended Wild Sheep and Goat Council meetings in Missoula, Montana.

July Presented paper on thesis results at the annual Border Grizzly/Wolf Technical Committee meetings--Waterton National Park, Alberta.

Sally Sovey

20 March      Attended NW Section meeting of The Wildlife Society in Coos Bay, Oregon, and presented papers entitled, "Nesting ecology of Canada geese on an irrigation reservoir in northwestern Montana," and, "Interpreting elk census and check station data in western Montana."

Tim Thier

22 May      Gave a half-hour presentation on the Black Bear Ecology Study objectives and preliminary results to 20-30 biologists and representatives from the U.S. Forest Service and MT Dept. of Fish, Wildlife and Parks at Sylvanite Ranger Station, Troy, Montana.

30 June      Met with reporter from the Bonners Ferry Herald (Bonners Ferry, Idaho) and was interviewed for article about the Black Bear Ecology Study.

10 July      Attended meeting of Region One employees for MT Dept. of Fish, Wildlife and Parks and gave brief presentation on Black Bear Ecology Study objectives and preliminary results.

17 July      Met with Mavis Harrison, a reporter for the Western News (Libby, Mont.), and was interviewed for article about the Black Bear Ecology Study.

23-25 July    Attended the 11th Annual gathering of members of the Border Grizzly Technical Committee in Waterton National Park, Alberta.

6 August      Interviewed by Susan Weller from KLCB Radio in Libby, Montana for their daily program "Voice of the Kootenai."

## PUBLICATIONS

- Allendorf, F. W., and R. F. Leary. 1986. Heterozygosity and fitness in natural populations of animals. Pages 57-76 in M. Soule, ed. Conservation Biology: The Science of Scarcity and Diversity. Sinauer Assoc.
- Becker, D. M., and C. H. Sieg. 1985. Breeding chronology and reproductive success of Richardson's Merlins in southeastern Montana. Raptor Res. 19(2/3):52-55.
- Becker, D. M. 1985. Food habits of Richardson's Merlins in southeastern Montana. Wilson Bull. 97(2):226-230.
- Becker, D. M. 1985. Early nesting records for Merlins in Montana and North Dakota. Raptor Res. 19(2/3):102.
- Dhungel, S. K., and W. D. Edge. 1985. Notes on the natural history of Paradoxurus hermaphroditus. Mammalia 49(2):301-303.
- Gyllensten, U., R. F. Leary, F. W. Allendorf, and A. C. Wilson. 1985. Introgression between two cutthroat trout subspecies with substantial karyotypic, nuclear and mitochondrial genomic divergence. Genetics 111:905-915.
- Hansen, H. J. 1986. Wolves of northern Idaho and northeastern Washington. Montana Cooperative Wildlife Research Unit, Univ. Mont., Missoula. 88 pp.
- Harris, R. B. 1986. Grizzly Bear population monitoring: current options and considerations. Montana Forest and Conservation Experiment Station Misc. Publ. 45, School of Forestry, Univ. Mont., Missoula. 87 pp.
- Harris, R. B. 1986. Reliability of trend lines obtained from variable counts. J. Wildl. Manage. 50(1):165-171.
- Knick, S. T., and T. N. Bailey. 1986. Long-distance movements by two bobcats from southeastern Idaho. Am. Midl. Nat. 116(1):222-223.
- Knowles, C. J. 1986. Population recovery of black-tailed prairie dogs following control with zinc phosphide. J. Range Manage. 39(3):249-250.
- Leary, R. F., F. W. Allendorf, and K. L. Knudsen. 1985. Developmental instability and high meristic counts in interspecific hybrids of salmonid fishes. Evolution 39(6):1318-1326.

- Matthews, W. C., S. K. Gregory, D. L. Mackey, J. J. Claar, and I. J. Ball. 1986. Impacts of water levels on breeding Canada geese and the methodology for mitigation and enhancement in the Flathead Drainage. BPA, Division of Wildlife, Annu. Rep. 1985. 118 pp.
- O'Gara, B. W., and D. C. Getz. 1986. Capturing golden eagles using a helicopter and net gun. Wildl. Soc. Bull. 14:400-402.
- Ream, R. R., and R. B. Harris. 1985. Wolf movements in southern Alberta. Natl. Geogr. Soc. Res. Rep. 21:405-409.
- Ream, R. R., R. B. Harris, J. Smith, and D. Boyd. 1985. Movement patterns of a lone wolf, Canis lupus, in unoccupied wolf range, southeastern British Columbia. Can. Field-Nat. 99(2):234-239.
- Servheen, C. W. 1985. The involvement of captive populations in the recovery of the threatened grizzly bear (Ursus arctos horribilis Ord) in the lower 48. Pages 499-506 in Proc. AAZPA 1985 Annual Conf. Sept. 8-12, Columbus, Ohio.
- Servheen, C. W. 1985. The status of the grizzly bear--progress toward recovery. Pages 400-415 in Roger L. DiSilvestro, ed. The Natl. Audubon Soc. Wildl. Rep.
- Servheen, C. W. 1985. Habitat research needs for grizzly bear recovery. Pages 14-18 in G. P. Contreras and K. E. Evans, compilers. Proc. of the Grizzly Bear Habitat Conf., April 30-May 2, 1985, Missoula, Mont. USDA Forest Service General Tech Rpt. INT-207.

#### Research Information Bulletins

- Eberhardt, L. E., R. G. Anthony, and I. J. Ball, Jr. 1986. Method for live-capturing adult Canada geese on their nests. RIB 86-33. 2 pp.
- Holm, J. W., and I. J. Ball. 1985. Nest success and cover relationships of upland-nesting ducks in northcentral Montana. RIB 85-97. 1 pp.



Pronghorns are difficult to immobilize from a distance because they have a very narrow tolerance to succinylcholine chloride, and they require huge doses of etorphine hydrochloride or xylazine hydrochloride. The latter two drugs require large darts that can cause excessive tissue damage to the thin-skinned animals with their small muscle masses and slender bones. Preliminary data from immobilization of five adult bucks on the National Bison Range, Moiese, Montana, indicate that carfentanil citrate, a comparatively new drug on the U.S. market, allows rapid immobilization of pronghorns using 1-ml darts. The average time from injection until the animals fell was 4 minutes, and the average dosage used was 2 mg of carfentanil and 33 mg of xylazine. The xylazine was added to reduce excitement and increase muscle relaxation. The small dart can be propelled by a light charge, resulting in little tissue damage, and injection is more positive than with a larger amount of solution. To reverse the effects of carfentanil, diphenorphone hydrochloride was administered at 8 times the drug dosage. Half was injected intramuscularly shortly after reaching the animals; the other half was injected intravenously to get the animals on their feet. Time from this injection until the animals were on their feet averaged 3 minutes.

Photo by Bart O'Gara

Back cover--Carfentanil has also proven to be the best drug yet available for immobilizing elk. Three mg of carfentanil and 50 mg of xylazine result in immobilization within 3-5 minutes. This short induction time is especially advantageous when one or two elk are darted in thick timber from a helicopter. With etorphine hydrochloride, up to 15 minutes was required and keeping the darted animal in sight until it went down was sometimes impossible.

Photo by John J. Craighead

